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USSR Report

CONSTRUCTION AND EQUIPMENT

No. 41

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CONSTRUCTION MACHINERY

NEW SUPPLY PROCEDURES SHOULD PROMOTE PRODUCTION, CONSTRUCTION WORK

Moscow MATERIAL'NO TEKHNICHESKOYE SNABZHENIYE in Russian No 4, 1981 (signed to press 31 Mar 81) pp 56-64

[Article by V. Korotchenko, doctor of economic sciences: "The Supplying of Articles and Equipment under the Five-Year Plan"]

> [Text] The system for supplying materials and equipment has an important place in performing the social and economic tasks contemplated by the 26th party congress. This system insures that social requirements in national economic plans correlate with the availability of material resources, that supply plans are realized, and that each individual enterprise and construction project is provided continuously and effectively with material resources for meeting the production tasks set for them.

The Balancing of Plans

The main areas for improving management of the system for furnishing supplies and equipment to production facilities are to raise the level of planning to meet the demands of the growing scale of production and of the increasingly complicated managerial ties and to further technical progress.

The plan for supplying materials and equipment includes materials breakdowns and the distribution of material resources by ministry, agency, Union republic and individual facility under construction of the most importance. Annual plans at present distribute material resources among almost 300 ministries, agencies, Union republics and construction projects of most importance. The number of enterprises and organizations to which funds are allocated for material resources by soyuzglavsnabsbyts [main administrations for the supply and sales of materials and equipment], Union-republic gossnabs and USSR Gossnab main regional administrations is in the tens of thousands. Planned distribution covers tens of thousands of types of materials, equipment and articles for production purposes that are rapidly being updated. The USSR Gossnab system, in carrying out supply plans, serves about 240,000 enterprises, construction projects and other economic organizations.

Each sector faces its own urgent tasks during this five-year plan. But, as was noted at the 26th congress, there are problems that cover whole spheres of the national economy, while the main one is that of converting to the intensive path of development.

"Intensification of the economy and a rise in its effectiveness, if we translate this formula into the language of practical matters," said Comrade L. I. Brezhnev in the Accountability Report of the CPSU Central Committee to the 26th party congress, "consists first of all in seeing to it that the results of production activity grow more rapidly than the expenditures therefor, and that comparatively fewer resources are involved in production work, so that it will be possible to accomplish more with the involvement of comparatively fewer resources. Planning and scientific, technical and structural policy should be subordinated to the solution of this task."

The development of materials breakdowns for the most important types of output and the setting of these balances for the main areas of use of this output during the concluding years of the five year plan in the "Main Directions" for the economic and social development of the USSR during the decade is basically new. Gosplan and Gossnab are developing these materials breakdowns for, respectively, 168 and 28 of the most important consolidated types of output for the period prior to 1990.

As is known, the role of five-year plans for national economic development are being changed considerably. They are now becoming not only the main form of planning but also the basic economic activity of ministries and production associations and enterprises. From now on, the fulfillment of five-year plans at all levels of production will be evaluated by cumulative results, from the start of the five-year plan, and not by the results for fulfilling the annual plans for the five-year period, as was the case previously. Five-year materials breakdowns that are computed by year of the five-year plan are to be developed, so these plans will be better substantiated.

Up until now Gosplan has been developing materials breakdowns for the five-year plan for a limited products mix and in the form of estimated breakdowns. Thus, 12 estimated materials balances were developed to substantiate the Eighth Five-Year Plan, 234 were worked out for the Ninth Five-Year Plan. For the first time, materials breakdowns were included in the national-economic plan during the 10th Five-Year Plan. The new thing today is that the materials breakdowns for a consolidated products mix are being developed directly within the five-year plans on a greatly expanded scale, and, for the first time, plans for distributing this output by principal capital holder, with breakdown by year of the five-year plan, will now be confirmed.

Materials breakdowns for 409 types of output were worked out in the plan for the economic and social development of the national economy during 1981-1985 and plans were made up to distribute 331 types of them, which comprise 65-85 percent of the resources distributed by principal capital holder, with breakdown by year of the five-year plan. Moreover, USSR Gosplan has worked out materials breakdowns for 300 types of output for the 11th Five-Year Plan. An expansion of long-term planning for supplying a wider range of products of materials and equipment at all levels of management of the economy will enable the reliability of plans for supply and the optimization and stability of economic ties to be raised.

Another important direction for raising the level of planning and for achieving stability in supply is conversion to the development of five-year plans from below, that is, planning will start with the enterprises and associations, on the basis of control figures set by USSR Gosplan, which will set tasks for producing output and firm norms and standards on the basis of long-term economic agreements.

Annual plans will call for the compilation of materials breakdowns for a broader products mix, which will make five-year plan tasks for the corresponding year and plans for distributing the products mix among capital holders more specific, and they will compute enterprise counterplans that are correlated with the supplying of materials and equipment.

A rise in the level of development of materials breakdowns and plans for distribution requires, first of all, improvement in the work of determining social requirements for effective types of resources and progressive norms for the consumption of materials, fuel and electricity; a concentration of resources in order to support the most important plan tasks; and a step-up in monitoring over plan realization and analysis of materials balances. In addition to the operating materials breakdowns that are developed by USSR TsSU [Central Statistical Administration], USSR Gossnab organized the development of operating materials breakdowns for 1,016 types of output by soyuzglavsnabsbyts and main regional administrations. In so doing, special attention will be paid to improving norm-setting for resources consumption at all levels of planning.

It is recognized that in the new era the five-year plan calls for established standards for a reserve of material resources for each year of the five-year period in order to: support construction work that is being done through the USSR Council of Ministers' reserve, extend assistance where there have been natural disasters, and support new requirements that arise during the fulfillment of tasks of the plan for economic and social development. Such standards for material-resources reserves have already been set by year of the 11th Five-Year Plan for 132 of the most important groups of output that are distributed by USSR Gosplan and for 292 types that are distributed by USSR Gossnab.

It should be emphasized that further improvement in the planning of supply is linked with an improvement of standard supply practices and the development (with the use of EMM's [methods of mathematical economics] and electron computers) of integrated specific-purpose programs, the solution of various problems in the development of economics, and the preparation of a system of integrated materials breakdowns for interchangeable types of output, breakdowns among types of output, and breakdowns in terms of in-kind costs, without which shortagefree supply cannot be organized.

Finally, an important task for planning organs with respect to improving planning in the supplying of materials and equipment consists in providing for the necessary correlation of the output that is distributed by USSR Gosplan with the output required for its rational use that is distributed by the USSR Gossnab system, ministries and agencies, and the appropriate Union-republic organs. In so doing, it is established that the ministry that is the prime ministry for producing the given output bears the responsibility for meeting the national economy's requirements for output of the necessary variety and quality.

Progressive Forms of Supply.

"Develop progressive forms and methods for the mutual production-economics relationships of associations and enterprises, organs that supply materials and equipment, and transport and other organizations, and strengthen their mutual responsibility for timely and good-quality fulfillment of plan tasks and commitments for delivering and hauling output in accordance with the customers' orders and long-term contracts." This is how "The Main Directions for Economic and Social Development of the USSR During 1981-1985 and During the Period up to 1990" defined a most important area for improving the supplying of materials and equipment during the new five-year period.

Under the new terms for planning industrial production and the supply activity, this task is carried out on the basis of the development of direct long-term economic ties among enterprises, guaranteed integrated supply, the realization of funds through USSR Gossnab enterprises for delivering output, based upon the principles of the wholesale trade, and the wide development of services that are made available to customers by supply organs.

The significance of progressive forms of supply is that they enable the national economy to obtain additional economic benefit by making the plan more concrete and by realizing it through the coordination and the production of a more effective output mix, improvement of output quality in accordance with the customers' orders, optimization in the dispatch and hauling of freight, a reduction of production reserves, a raising of the level of mechanization of loading, unloading and transport work, and more rational use of various types of packaging and preparation for transport, as well as through other factors that are based upon collaboration and mutual concurrence in the terms for shipping output. In this way, periods for formulating and changing orders (or specifications) is shortened from 3-4 months to 12-15 days. In developing collaboration based upon the conclusion of agreements between enterprises directly or with supply organs for a long period, enterprises strive to bring the output produced up to the level of the best contemporary models, while reducing the materials intensiveness thereof.

Among the basic forms of economic relationships among enterprises are direct long-term economic ties. Under these relationships, all questions and terms for the shipment of output (the products mix, quality, deadlines, transportation terms, packing, and settlement for the output) are determined directly by the enterprises.

USSR Gossnab organs, jointly with ministries, agencies and Union republics, are steadily developing direct long-term economic ties between enterprises. The output volume sold by USSR Gossnab and delivered under direct long-term economic ties rose 1½-fold during the 10th Five-Year Plan--from 30 to 45 billion rubles. At the end of the 10th Five-Year Plan the estimated volume of shipments made under direct ties included sales of half of the ferrous metals output, 60 percent of the chemical products, 78 percent of the bearings, 85 percent of the lumber and 90 percent of the cement.

During the 10th Five-Year Plan the production associations and enterprises were basically converted to direct long-term ties. However, there are some important deficiencies in the functioning of direct ties that reduce their efficiency. There are cases of violation of the direct ties by supply-and-sales organs and by ministries. Tying customers to suppliers with orders for 1 year instead of with long-term plans is being allowed.

Supplying enterprises often refuse to conclude agreements to deliver some types of output that are not advantageous to them. In this connection, the new five-year plan obligates ministries and agencies to work out and confirm (with the participation of USSR Gossnab organs) for their production associations (and enterprises), taking into account their specialization, a listing of the output for production-equipping purposes that is subject to manufacture and shipment, in accordance with which customers and supply-and-sales organizations conclude agreements for shipping the needed output within the ceiling of the funds allocated.

USSR Gossnab and USSR Gosarbitrazh [State Arbitration] last year approved standard-practice instructions on the procedure for concluding economic agreements for shipping output for production-equipping purposes, under which agreements for direct long-term economic ties are concluded, as a rule, by a grouped products mix (or assortment) with breakdown by year with details as to product mix to be spelled out later and refined during the compilation of annual plans. During the current five-year plan, direct long-term economic ties for output sold by USSR Gossnab will grow. These ties will be widely developed for output that is sold by ministries and agencies.

One of the progressive ways for supplying associations (or enterprises) and organizations with material resources is guaranteed integrated supply, which is performed on the basis of agreements concluded with USSR Gossnab organs. Its essence lies in the supply organs' undertaking commitments not only to ship output from their enterprises to customers on time and in full sets in accordance with the customers' orders and mutually agreed schedules but also to guarantee through shipments, which are made in accordance with the agreements that have been concluded by the customers directly, or by supply organs, with the manufacturers of the output. This guarantee is kept by Gossnab organs by transmitting to customers a portion of their planned reserve stock (and also standards for working capital and worker manning to Gossnab enterprises) and by manipulating the material resources that are available in the supply organs' area of activity. Thus, this form of supply will enable a portion of the customers' reserves to be concentrated in the statewide system of supply, and the increased manipulability of the resources will improve supply with relatively fewer reserves.

The gossnabs of the Ukrainian and Belorussian SSR's and the Moscow, Moscow City, Leningrad, North Caucasus, Kievan, Middle Urals, Volga-Vyatka and Murmansk main regional administrations have gained substantial experience in developing guaranteed integrated supply. During the 10th Five-Year Plan the number of industrial enterprises covered by this form of supply more than doubled, reaching 9,000 enterprises. During the current five-year plan, the volume of shipments under this form of supply will grow from 9 billion to 15-18 billion rubles.

During the 11th Five-Year Plan it is planned to further develop and improve contractual relations between customer enterprises and supply organs. Thus the practice of main administrations concluding only long-term contracts with customer enterprises to supply them with all types of output sold by the main administrations and shipped from either enterprises for shipping output or by through shipment (except for direct ties) has been developed widely in the Central Chernozem Zone by the main regional administration and supply organs.

The broad development of a system of services that are extended to customers by material-and-equipment supplying organs and enterprises and which are component parts of integrated supply is becoming a new and promising direction for improving the organization of supply during the 11th Five-Year Plan.

More than 300 sections for preparing materials for production-type consumption have now been established. It is planned to bring the amounts of output prepared by USSR Gossnab-system enterprises for production-type consumption up to 3 million tons for ferrous metals, 60,000 tons for nonferrous metals, 1.3 million tons for chemicals, 135,000 tons of paper products and 250,000 tons of cable products in the next few years. Right now specialized departments are being built, with modern industrial equipment for the primary industrial processing and preparation of ferrous and nonferrous metals, paper and cable products for production-type consumption, and also departments for the bottling and packaging of chemicals in small containers.

The concentration of primary processing and preparation of materials for industrial consumption that production enterprises are carrying out for regional supply organization enterprises will provide for more effective use of the country's equipment and material and labor resources.

The USSR Gossnab system is now operating 40 centers (in 1975 there were 4, all told) for rolled products for instruments, which are satisfying the requirements of 7,000 customers. Rolled products for instruments and for industrial operating equipment have proved to be one of the more effective forms, under which demand by a large number of customers is satisfied with the fewest instruments, which often are very expensive, and other industrial operating equipment. Thus, Lenorgnauchkomplektsnab [Leningrad Organization for the Supply and Sales of Complete Sets of Scientific Equipment] has a pool of 5,000 units of rolled products for instruments, of 600 specified items worth 3.8 million rubles. Its services are used by more than 1,150 enterprises and organizations. The utilization coefficient of the rolled products' pool has reached 65 percent. A new form of services for rolled products for industrial operating equipment based on intermediary origins has been introduced here. A card index based on supply and demand has been established. Agreements for intermediary rolled products have been concluded with 170 enterprises and organizations. During the 11th Five-Year Plan the pool of rolled products for instruments is to be greatly expanded and rolled-products centers are to be created in all USSR Gossnab regional administrations.

In accordance with the CPSU Central Committee and USSR Council of Ministers decree about improving the economic mechanism, USSR Gossnab is required to complete its conversion to the centralized delivery of freight from enterprises for making shipments of the output of the regional organs to customers, which will enable the use of transport and labor resources to be greatly improved in the national economy. Today this task has been basically solved practically only in the Moscow City, Far Eastern, Bashkiria and Murmansk USSR Gossnab main regional administrations and in the Lithuanian, Estonian and Kazakh SSR gossnabs, where the level of centralized shipment of freight to customers has reached 90 percent or more.

The Integrated Supply of Construction Work

The 11th Five-Year Plan calls for radical changes in supplying construction projects that are included in the state capital construction plan. They will be supplied with materials in integrated fashion through USSR Gossnab main regional administrations on orders of construction and construction-and-installing organizations, in accordance with their requirements as determined by designs and budget estimates.

Conversion from the supplying of construction in accordance with branch-of-industry norms per 1 million rubles' worth of construction and installing work to supplying them in accordance with the work actually carried out on schedule, in accordance with actual requirements, will enable elimination of the dispersion of resources over individual construction projects and will enable resources to be concentrated in a system of regional USSR Gossnab organs. This will allow the flexible manipulation of resources and active monitoring over their use, and, the main thing, it will guarantee precise uninterrupted supply for construction projects. The advantages of the new system for organizing construction-project supply has been confirmed by experience. At present, construction projects are supplied on order in accordance with designs and budget estimates in the cases of 27 construction organizations, whose total construction and installing work volume is 5.4 billion rubles, including organizations in the Ukrainian (the Dnepropetrovsk regional administration), Kazakh (Tselinograd regional administration), Belorussian, Latvian, Moldavian, Turkmen and Estonian SSR's and in the Upper Volga, Volga-Vyatka, Moscow, Murmansk, Volga, North Caucasus, Middle Volga, Tatar, Tyumen' and Central Chernozem main regional administrations.

An analysis of the effectiveness of the new system is characterized (according to NIIMS [Scientific-Research Institute for the Economics and Organization of the Supplying of Materials and Equipment] information) by the following data: working capital locked up in reserves of construction organization resources (taking Gossnab organizations into account) has been reduced by 8.4 percent; the prime cost of construction and installing work has been cut by 4 percent; construction organization profit has increased by 0.06 percent, and labor productivity has risen by 2.1 percent.

At the same time, the problem had to be solved by implementing an entire system of measures to improve the work of design organizations and to increase their responsibility for determining the rational requirements of construction projects for resources, for raising the role of the capital-holding construction ministries for full correlation of the amounts of construction with the required resources, and so on.

The introduction of capacity depends upon how well questions of outfitting construction projects with equipment are solved. Under the new procedure, orders are now to be issued to the manufacturing ministries for delivery of the basic operating and power-engineering equipment for the whole period of construction and for the delivery of constructional structure for, as a rule, at least 2 years. It has been established, in this case, that orders (or warrants) for the delivery of equipment that USSR Gossnab issues will be in effect until they are fully carried out by the suppliers. Moreover, measures have been taken to expand the delivery of outfitted installations, assemblies and production lines to construction projects.

A large amount of construction and installing work is being done by the in-house method. With a view to improving supply for these construction projects, USSR Gosplan and USSR Gossnab should call for the allocation of material resources in accordance with the norms approved for the corresponding industries and should allot the necessary construction mechanisms and transport equipment.

A procedure also has been adopted under which a construction lag that is permitted for a given year should be made good the next year through the use of material and equipment resources not used in the preceding year and ministry and agency reserves.

All these measures for improving supply for construction purposes, plus changes in the main indicators for evaluating and motivating construction work, will help to raise capital-investment effectiveness and speed up the introduction of capacity.

The Rational Use of Material Resources

The "Main Directions" call for a rise in the role of USSR Gossnab organs in insuring the rational use and savings of material resources. The task of USSR Gossnab organs on rational use and savings of material resources consists primarily in establishing strict, continuous monitoring over effective use of the material resources allocated to ministries and individual enterprises. This monitoring over consumption norms is established in different forms. These are, principally, estimates of the requirements for material resources based upon the use of progressive norms. For example, in 1980 USSR Gossnab organs, jointly with enterprises and ministries, revised more than 100,000 norms, enabling 32 million rubles' worth of resources to be saved.

The active element of monitoring is systematic checking by USSR Gossnab regional-organ inspection of the conditions for storage and use of material resources at enterprises and construction projects, an examination of measures being taken to improve the use of resources, and, where materials are squandered, a reduction in deliveries and in funds allocated to the enterprises.

The All-Union public inspections of the effectiveness of use of raw and other materials and fuel and power resources that were announced by joint decree of the AUCCTU, the Komsomol Central Committee and USSR Gossnab have an important place in the drive to save resources. During the 1980 inspections 8,319 recommendations were implemented in the USSR Gossnab system with an annual saving of 68 million rubles' worth of material resources.

USSR Gossnab and its soyuzglavsnabsbyts [main administrations of supply and sales] and regional organs were called upon, jointly with the industrial ministries and their production elements, to develop and implement primarily measures for speeding up the mastery and production of new, progressive and economical equipment and for reducing the materials intensiveness of the output produced. For example, due to measures approved by USSR Gossnab and USSR Minlesbumprom [Ministry of Lumber and Paper Industries] for reducing the weight of a square meter of paper for corrugating and the weight of paperboard for flat layers of corrugated paperboard, 616,700 cubic meters of wood raw material were saved during the 10th Five-Year Plan alone.

A study of the requirements and the substantiation of orders and of calculations in accordance with technical standards documentation has enabled Soyuzglavpodshipnik [Main Administration for the Supply and Sales of Bearings], during 1979-1980, to cut unsubstantiated customers' orders by 2.5 million items, to use up to 20 million bearing items for repair and operating needs in the national economy by restoring worn bearings, and to replace imported bearings worth 900,000 rubles in nonconvertible currency by domestic bearings.

Of great interest is the operating experience of Soyuzglavelektroapparat [Main Administration for the Supply and Sales of Electrical Equipment] in checking substantiation of the use of low-voltage equipment in newly developed articles for machinebuilding, in capital construction facilities, in articles currently produced, and in standard designs for large-scale use that are approved by TsITP [Central Institute of Standard Designs] of USSR Gosstroy. Soyuzglaveleketroapparat saved 45 million rubles' worth of low-voltage equipment in this way during the 10th Five-Year Plan.

Major reserves for savings are to be found in intensification of the work of supply organs to bring above-norm and unused material resources that exist at industrial and construction enterprises into economic circulation. During the 10th Five-Year Plan the USSR Gossnab system, jointly with enterprises of ministries and agencies, brought more than 14 billion rubles' worth of such resources into production circulation.

The Main Directions call for work to continue on the broader involvement of secondary materials and fuel and power resources, and also of incidental output, into economic circulation.

During the 10th Five-Year Plan Soyuzglavvtorsyr'ya [Main Administration for the Supply and Sales of Secondary Raw Materials] procured 16 million tons of secondary raw materials (waste paper, secondary textile materials, worn tires, broken glass, and secondary industrial raw material), and produced more than 800 million rubles' worth of industrial output from it. During the 11th Five-Year Plan the procurement and processing of secondary raw materials will be further developed.

The new economic mechanism calls for the use during the five-year plan of fixed prices in industry and budget-estimated prices in construction, which will create an economic incentive for collectives of enterprises and construction projects to save materials and reduce production outlays and prime costs of output and of construction and installing work, with a view to providing for growth of profit. and, accordingly, of economic incentive funds under the fixed prices.

With a view to increasing the motivation of production associations (and enterprises) to make better use of production capital and to save material resources, it has been accepted that the established charges for above-standard reserves of material valuables and of uninstalled equipment not covered by credit henceforth will be exacted from the profit that remains at the disposal of associations, enterprises and organizations. And, on the contrary, when production plans are met at capital costs less than called for in the plan, the savings in payments for the use of capital will remain at the disposal of the associations and enterprises. New economically substantiated standards for working capital should be approved in the near future. The role of USSR Gossnab organs in the rational manipulation of resources will be raised. They have now been given the right to revise and refine the physical assets of enterprises and ministries that are called for in the plan and to decrease the amounts thereof when there are above-norm output reserves at enterprises.

A Strengthening of Cost Accounting

The problem of improving cost accounting in our system covers three levels of management: enterprises and organizations of the main regional administrations, the soyuzglavsnabsbyts and soyuzglavkomplekty, and the sector as a whole. USSR Gossnab associations and enterprises that deliver the output of products now use cost accounting as standard practice.

An important problem in improving the cost accounting of associations and enterprises that deliver output is conversion to a system of markups and rebates that reflects more precisely and completely the level of expenditures for supply and sales organizations for the output they sell and the necessary profitability level. It is further desirable to expand the participation of the USSR Gossnab main regional administrations in contractual cost-accounting relationships with producer-type customer enterprises in through-shipments of materials. This form of organizing supply has a large share in the total volume of shipments. In connection with the creation within the USSR Gossnab system of associations for delivering output, internal cost accounting should be developed substantially. This is necessary first of all in order to further develop the initiative and raise the responsibility of the various subunits and sections for precise and effective performance of the functions they are charged with.

In performing their duties, the soyuzglavsnabsbyts enter into cost-accounting relationships with main regional administrations and cost-accounting organs of the ministries in order to improve the supplying of the national economy with output for industrial-production purposes, in accordance with contracts concluded and the rational use of material resources. The soyuzglavsnabsbyts use earned income to completely cover their upkeep costs, to reimburse the main regional administrations for the expenditures for sorting out the output from interrepublic (and interregional) enterprises that ship output, and to enable profit to be obtained in the amount necessary to form economic incentive funds and to make budget payments. They are allotted their own working capital. USSR Gossnab main regional administrations deduct a portion of the soyuzglavsnabsbyts' income. In case of nonfulfillment of shipment plans, payments to the soyuzglavsnabsbyts are reduced as a function of the amount of the shortfall. The cost-accounting relationships of the soyuzglavsnabsbyts with All-Union industrial associations are determined in accordance with existing legislation and the contracts concluded between them. The further development of contractual relationships of USSR Gossnab supply and sales organizations with customers and suppliers is an important task for strengthening cost accounting in supply organs.

Along with work to expand contractual relationships, work to further improve them will continue. The CPSU Central Committee and USSR Council of Ministers decree about improving the economic mechanism stated that the economic penalties called for by law or contract for violation of commitments for delivering output will henceforth be applied in a mandatory procedure and without mutual deductions. At present, the indicator of fulfillment of economic agreements and plans for deliveries is the main criterion for evaluating the activity of supplying and equipping organs and one of the main indicators for awarding bonuses to the workers of these organs. An economic agreement in the modern era has become a basic document that determines the rights and responsibilities of the parties for the effective organization of the supplying of materials and equipment.

Later, with a view to intensifying economic responsibility for fulfillment of the functions vested in USSR Gosstroy and for the results of financing and economic activity and to increasing incentives for supply and sales organizations to make more effective use of material resources and to support plans for supplying materials and equipment, it would be desirable that USSR Gossnab, as did the industrial ministries, establish for the five-year plan stable standards for deductions from profit (differentiated by year) that will be placed at the disposal of the committee. This portion of the profit will be reserved for financing capital investment, repaying bank credits and paying interest thereon, supporting growth of working capital, and forming a fund for developing science and technology, economic incentive funds, and funds for other planned expenditures for development of the sector. This will create more favorable economic conditions and raise the responsibility of supply workers for developing the sector in accordance with the needs of the national economy.

The realization of measures for improving mutual economic relationships in the realm of supply and sales will help to increase effectiveness in supplying materials and equipment for supporting production operations and capital construction, for purposes of achieving the best final results for the national economy.

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CSO: 1821/082

BRIEFS

NEW CONCRETE PLASTICIZER--Builders know no limits to their demands about concrete: they want the mortar to be sufficiently thick yet sufficiently fluid to fill all the holes in the forms. To satisfy these demands is difficult. In order to settle the mortar in the forms it is frequently necessary to use vibrators. Can this operation be avoided? Yes, if the superplasticizer and thinner "S-3" which was developed at the Scientific-Research Institute for Organic Intermediate Products and Dyes is used. Even small quantities of it can reduce the viscosity of the concrete so that it can be pumped into the forms. Consequently, there is no need for vibration-tamping equipment because the concrete fills the most complex forms easily. The "S-3" plasticizer increases the strength of the concrete, which permits a decrease in the amount used. [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 28 May 81 p 4]

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METALWORKING EQUIPMENT

SELECTED ITEMS FROM MACHINEBUILDING JOURNAL

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Orienting Parts With a Robot

Moscow MASHINOSTROITEL' in Russian No 5, May 81 (signed to press 5 May 81) pp 9-10

[Article by B. V. Pogorelov, candidate of engineering sciences]

[Text] Automatic orientation and feed of parts to an assembly position is one of the hardest problems to solve in automating manufacturing and assembly processes because of the great variety of types and sizes of parts, because of the absence of universal equipment and methods of orienting them, because of the limited nature of the work zone, and because of the need to match the productivity of the manufacturing and the loading equipment. This problem cannot be solved with the existing specialized devices, since they cannot be adjusted for the orientation of parts of a different type and size. In addition, such devices ordinarily operate passively, which, if the number of positions of the parts to be distinguished is large, does not allow for attainment of high productivity in orientation. In large-series and series production it is advisable to use adjustable orienting devices that operate actively by identification of the position occupied by the part and its subsequent change to the required position. This pattern of operation is achieved most effectively with an adaptive robot.

The orienting robot developed by the author contains the pneumatic discriminator 1, which is installed in the chute of the vibrating hopper 2, the program-changing unit 3 (BIP), the control unit and a two-arm manipulator built up of modules.

The numerical pneumatic system which drives the sweep of the arms (author's certificate 745671) consists of three consecutively connected modules 5, 6 and 7 with maximum angles of sweep of 30, 60 and 120°, respectively. The design provides for the possibility of regulating the angle of sweep and for connection of the modules in any combination. The upper arm 8 is fastened on the outlet shaft 7, is equipped with a bellows drive 9 for its rocking motion and numerical pneumatic cylinder for the sweep of the pickup 10 through angles of 90, 180 and 270°. The lower arm has the sweep module 11 for the angle of 180°, and the pneumatic cylinder 12 for extending the lower pickup 13 is attached to its shaft. When the drive is not actuated, the upper arm is located over the lower arm at the positions III, IV, V and VI. Depending on the combination in which the sweep modules 5, 6 and 7 are actuated, the upper arm is capable of eight positions with intervals of 30° (indicated by Roman numerals) and the lower arm four.

We will illustrate the manipulator's operation with the case of loading two assembly positions IV and V with the flat parts 14 and 15, each of which can take four different positions. The parts are located in the vibrating magazines (positions I and VIII) with covered exit chutes and are fed to a stop. When they are in the position a_1 and a_2 at positions I and VIII, they are identified by the pneumatic sensors. The BIP unit memorizes their position and makes corresponding changes in the overall program which is set on the plugboard of the control system 4 (SU). If the part at position I is in the correct orientation (a_1), the upper arm 8 picks it up and sweeping through 90° transfers it and lowers it to assembly position IV. The lower pickup 13 is in this case retracted and does not hinder delivery of the part. Thereupon the arm 8 moves to the position VIII, picks up the part 15, delivers it to the assembly position V and returns to its initial position at position I, where it awaits commands from the production equipment for the beginning of the next cycle.

Turning a part in the orientation b_1 to the correct orientation requires that it turn 180° about its vertical axis. In this case the manipulator works the same way as in the previous case, but with the difference that as the upper arm sweeps to the position IV, the pickup 10 makes a 180° revolution. The part is fed to the assembly position by the arm 8 in the correct orientation. Turning a part in the orientation c_1 to the correct orientation requires that it turn 180° about its horizontal axis. In principle this rotation could be accomplished by the upper arm 8 as well, but then the pickup 10 would end up under the part, which would hinder its being delivered to the positioning device. In this design, then, parts in the orientations c_1, c_2 and d_1, d_2 are transferred from the upper arm to the lower arm and subsequently turned 180° about the horizontal axis of the lower arm. For example, after a part in the orientation c_1 is picked up, the upper arm carries it to position III, and pickup 13 of the lower arm extends so that it is precirely under the part. Then it is transferred from the pickup 10 to the pickup 13, the arm 8 goes to the position II, the part is rotated 180° about the horizontal axis by means of the drive 11 and delivered to the positioning device by the lower arm.

In case of the orientation d_1, in addition to these operations the pickup 10 turns the part 180° about the vertical axis as it is carrying it to the position III. The manipulator performs analogous motions with the parts 15. Its design allows it to orient parts which have up to eight different orientations, i.e., those parts which are the most common in machinebuilding, instrumentmaking and other industries.

Tests of the experimental prototype of the robot RO-6 have shown that the length of the cycle, including recognition of the orientation of a part with a mass of 0.02 kg, its pickup, its orientation including rotation through 180° about the two axes perpendicular to one another and the feed, is 1.8 seconds. Further reduction of the length of the cycle is limited in this case by the capabilities of the control system and the inertial loads causing the part to begin to shift relative to the electromagnetic pickup. If pickups eliminating this shifting are used, the length of the cycle could be reduced even more. Adjusting this robot for orienting and feeding parts of a different type and size necessitates sensors of the discriminating device so that for every different orientation of the part there would be a specific combination of signals from the sensors, and a new connection is also made of the logical elements of the BIP, determining in this way the orientation in which the part will be delivered to the production position. The design also makes it possible to replace the pickups if necessary. The program needs to be changed only if the new part has a different number of different orientations. Since the manipulator performs an active operation of orientation, it is not necessary for parts with the wrong orientation to be returned to the magazine and for its rate of output to be speeded up.

The manipulator RO-6 is recommended for use in serving robotized complexes for assembling units.

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Work Quality Assessment Needed

Moscow MASHINOSTROITEL' in Russian No 5, May 81 (signed to press 5 May 81) pp 25-26

[Article by V. V. Savin]

[Text] One of the essential problems in improving management of the quality of work is improving approaches to work evaluation. Correct evaluation performs the role of an incentive for improving the quality of work and serves as a reliable instrument in managing it.

Comrade L. I. Brezhnev, general secretary of the CPSU Central Committee, pointed out the need to seek out progressive new approaches to solving the problems of improving quality indicators in all segments of the national economy in his address at the December (1974) Plenum of the CPSU Central Committee: "... practical implementation of the course toward raising efficiency and improving qualitative indicators is a complicated matter. Many things in this connection need to be conceived in a new way, and new approaches and solutions have to be sought. Otherwise we will not break free of inertia and will not eliminate the bottlenecks that are holding back the growth of our economy."

The importance of the problem of improving approaches to evaluation of the quality of work is especially enhanced when comprehensive product quality control systems (KSUKP) are being extensively introduced at enterprises. And in connection with the introduction of the Uniform State Product Quality Control System in the USSR, the possibility of using a uniform evaluation of work quality is an aspect of that problem that is especially urgent.

Evaluations of work quality that differ both in form and also in conception are now used in practice. The following three types of evaluation are the most common: the percentage of acceptance of products on the first sample, the coefficient of work quality, and point-system evaluation. Moreover, each of these types of evaluation has its different versions.

The percentage of product acceptance on the first sample is ordinarily used to evaluate the work quality of workers delivering products to the OTK [technical inspection division] and paid on a piece-rate plus bonus basis. The workers at the enterprise are classified into groups as a function of working conditions, occupation, the technology for manufacturing the product and other specific peculiarities of production. A scale is devised for each group in order to evaluate work quality and to determine the size of the bonus. At certain enterprises there are more than 20 such scales.

Depending on the peculiarities of production the intervals used in scoring the work of workers on the basis of acceptance on the first sample and awarding them bonuses vary from scale to scale. For instance, one and the same percentage of acceptance of products on the first sample (for example, 95 percent) may in some cases indicate excellent quality of work, and in others poor quality. That is why it is very difficult to use such an evaluation in comparing the quality of work of workers placed in different groups.

The percentage of acceptance on the first sample characterizes only one aspect of the quality of work, specifically it classifies skill in manufacturing products. While at the same time in determining the size of the bonus consideration is given not only to this one property of the quality of work, but to the entire set of its properties, including productivity, and also those properties which the worker must show to qualify for a particular group (bonus scale).

The second type of evaluation--the coefficient of work quality--is determined with respect to several indicators. Indicators which express the characteristics of work are usually used here. In such cases the quality of work is represented by the set of its characteristics. Thus the evaluation itself takes on a different meaning; it no longer defines just one characteristic of work, but the entire set of characteristics.

But cases are not uncommon when indicators expressing the characteristics of work are applied in conjunction with indicators that do not express those characteristics, but define other factors.

For example, among the indicators which do not express the characteristics of work we might name the indicators "breach of social order" or "active participation in civic work," which are encountered in the standards of certain enterprises. The first of these indicators indicates a person's unseemly actions, and the second activity on his part useful to society. It is clear that in the first case the person should be penalized, and in the second rewarded. But does this need to be done through evaluation of the quality of work? All of a person's activity cannot be regarded as work, and the indicator describing his nonwork activity cannot be equated with the indicator that expresses the quality of his work. The question accordingly arises of how a sufficiently clear-cut distinction can be made and what should be included as work when its quality is evaluated in the KSUKP?

Since the evaluation of the quality of a worker's work is made at the enterprise, it is logical, then, to evaluate it in the same way as this is done in defining the labor agreement in the labor codes of the union republics, i.e., work is understood to be man's activity aimed at performing duties under a labor contract. It is best, then, to use the indicators expressing the quality of precisely that activity in evaluating the quality of work.

The coefficient of work quality is used both for workers who submit products to the OTK and also for other workers. If this coefficient is used for evaluating the quality of work of workers submitting products to the OTK, then the percentage of acceptance on the first sample is one of several indicators used. Consequently, evaluation of the work of manufacturing products figures here as one characteristic within a set of characteristics of work that represent its quality.

Use of the coefficient of work quality has different versions in which the intervals of its numerical values differ. Usually the numerical values of the coefficient are distributed in the vicinity of unity. The most common version is the one in which the highest value of the coefficient of work quality is set at unity. But the lower values in the various cases are not always identical: sometimes they go to zero, sometimes 0.5, and sometimes there are different quantities. Values greater than unity are also used.

In some cases only indicators which reduce the coefficient are used in determining the coefficient of work quality K, while in others both positive and negative indicators are used. When only indicators that reduce the coefficient are used, then the coefficient of work quality is ordinarily computed from the formula

$$K = 1 - \Sigma K_c,$$

in which ΣK_c is the sum of standard coefficients of reduction set forth in standards of the enterprises for each indicator on which reduction is based. In this case the coefficient of work quality may not be greater than unity.

When both positive and negative indicators are used, then the coefficient of work quality is usually computed from this formula

$$K = 1 - \Sigma K_c + \Sigma K_p,$$

in which ΣK_p is the sum of standard incentive coefficients established with respect to the incentive indicators. In this case the coefficient of work quality may be either less than, greater than or equal to unity.

The use of a differing set of indicators in the two versions we have examined and the use of different formulas for computing the coefficient of work quality and different intervals of its numerical values greatly complicate comparative evaluation of the quality of work by means of the coefficient K.

The method of evaluation based on a point system also has versions differing in the number and value of the points. Two versions of the point scoring system are most widespread.

In the first version the values of the points are established as equivalent to the values of the coefficient of work quality. In this case the scoring system used is usually "5," "4," "3," "2," which are equated with the concepts "excellent," "good," "satisfactory," "poor." The second version consists of establishing correspondences between the point values and the number of notices issued to the worker for violations of indicators of work quality. In this case the point scores usually used are "5," "4," "3," "2," and "1." As a rule this is associated with a bonus system in which each point corresponds to 20 percent of the bonus. With the highest score of "5" the worker receives 100 percent of the bonus stated in the regulation, and with a score of "1" he receives only 20 percent. Since no bonus would be paid for poor and very poor work, it should be assumed that scores of "2" and "1" are not equated with the concepts "poor" and "very poor." The meaning of the scores is different here than in the first version.

This means that a comparison of work quality even within the limits of these versions by means of point scores, which are very close in their form, but differ in their connotations, also causes considerable difficulties. If we are to be able to compare the quality of work of different workers, we need to have a uniform evaluation. Unless such an evaluation is introduced, comparative analyses of work quality and the working out of actions to manage work quality are possible only with respect to each separate approach.

There is no substantial difficulty in solving the problem of making the evaluation uniform. A uniform evaluation must be one that is suitable in use to compare the quality of work of different workers and one that is quite clear to everyone. This requirement is met, for example, by an evaluation expressed in points "5," "4," "3," and "2," which correspond to the terms "excellent," "good," "satisfactory," and "poor." Connotative uniformity of scores is achieved only when the quality of work is uniformly defined.

GOST [State Standard] 15467-79 defines the quality of a worker's work as the "total set of characteristics of the process of work activity dependent upon the worker's ability and desire to perform a particular assignment in accordance with the requirements which have been set." One easily notes that in most cases the existing valuations that have differing verbal connotations do not fit into the definition of the quality of workers' work given in this standard.

If the quality of work is to be evaluated in accordance with the definition of the GOST, it is very important to correctly select the indicators that express the essential characteristics of the work and on which the worker's attainment of the necessary results depends. It is evidently best to make the selection on the basis of what sort of duties are assigned to the worker under the labor contract and what sort of results he is supposed to achieve in performing those duties. Evaluation of work quality will then have a uniform meaning, since it will be proposed for all workers with respect to one and the same factor, precisely the factor of how the worker performs his duties under the labor contract.

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Product Defect Analysis

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[Article by L. G. Kikinzon]

[Text] Analysis of product defects, which is done at our plant, makes it possible to quickly and reliably ascertain the causes of departures from the requirements of technical documentation and also to eliminate the possibility of their occurrence in the future.

The principal causes of the occurrence of product defects are as follows:

a. production process does not meet the requirements of standards and technical documentation;

b. the requirements of the technology have not been met in the manufacturing process or tests;

c. equipment that is not in proper working condition, is worn out or which was not envisaged by the manufacturing processes is used in manufacturing the product or in testing it;

d. mechanical damage in the process of manufacture, storage and shipment;

e. failure to meet requirements as to the storage of the products meeting standards and punctual separation of those which do not;

f. workplace inadequacy;

g. use of materials and intermediate products which are subgrade or not envisaged by the manufacturing instructions;

h. use of purchased products whose shelf life has expired or which give unstable indications in input inspection;

i. failure to meet requirements of manufacturing instructions in welding, soldering, preparation and application of glue and rubber compounds, in the process of galvanization or applying paint or varnish, in heat treatment, in the stamping of plastics, and so on;

j. operative's low skill or carelessness;

k. improper planning of jigs, tools and fixtures;

l. mistakes in design.

Under plant standard STP 656.357-76 the TB (technology bureau) and BTK (technical inspection bureau) of the shop in which a defect is detected conduct the primary analysis. If the cause of the defect is obvious, then the chief of the BTK makes this known to the management of his shop, and also to the management of the shop or division responsible for the defect's occurrence. They take steps to correct it, they compile an official report on the analysis and they work out measures that eliminate the possibility of the defect's recurrence in the future. If the primary analysis is unable to ascertain the cause of the defect, then the manager of the shop so informs the chief engineer or his deputy, and they appoint a commission to conduct an analysis. The chief of the shop in which the defect was detected is the person responsible for conducting the analysis and the chairman of the commission organized for that purpose. The members of the commission must include representatives of the divisions of the chief mechanical engineer, the chief process engineer, the chief inspector, and representatives of other staff services and shops if necessary.

The analysis is conducted according to the program of the study drafted by the commission; it is based on the method of successive elimination of unknowns. Statistical information concerning analysis of similar defects previously encountered is examined before the program is drafted. The program indicates the full range of the work required to discover the causes of the defect and also the methods of investigation, the sequence in which the steps are taken, those who are responsible for conducting the various steps, and the deadlines for completion of the parts of the work.

The principal steps in the investigation are as follows:

i. the writing up of a straightforward and technically detailed statement of the defect, including indication of the size (or character) of the deviation from the requirements of the technical documentation;

ii. inspection of the defective article (assembly, unit or part), measurement of the geometric, electric or other (depending on the nature of the defect) parameters;

iii. verification of the correspondence of the testing (inspection) method to the requirements of the technical documentation;

iv. check on whether the requirements of the technological process of manufacturing were met;

v. check of the proper working order of equipment and tools, jigs and fixtures, as well as of their conformance to the technological documentation;

vi. questioning of workers performing the operation in which the defect occurred, check on the correctness of the operation's performance;

vii. successive analysis of the defective part with a step-by-step examination and verification to determine the correspondence of the individual elements of the design to the specifications of the technical documentation;

viii. use of nondestructive methods of inspection (radioscopy, radiography, luminescence flaw detection, ultrasonic inspection, magnetic inspection, measurements in the central measurement laboratory, and so on);

ix. use of destructive methods of inspection (cutting open, metallographic or chemical studies, and so on).

The following are done if necessary: drawings and computations of dimensional linkages; strength and other computations; strength (dynamic or static) tests; tests of a simulated model; repeat tests of the defective article, sometimes with more rigid (than the given) testing conditions; additional tests under a special program aimed at reproducing the defect.

The commission draws up the official certificate of the analysis according to the results of the work done; that certificate indicates the established cause of the defect, the person responsible, a finding as to the possibility of further use of the product (unit, assembly or part) and also measures to avert the possibility of recurrence of the same or a similar defect. If it has not been possible to ascertain with confidence the true cause of the defect, the commission indicates in the certificate one or several of the most probable causes. The official papers of the relevant services are attached to the certificate of the analysis; conclusion of the central measurement laboratory on the results of measurement; conclusion of the central plant laboratory on results of metallographic studies; certificates on the results of strength tests, and so on). The certificate indicates the last names of those who are to take steps and the dates for their performance, as well as the last name of the worker who is to follow up on fulfillment. If eliminating the defect requires considerable work to alter the manufacturing process, to manufacture new jigs, tools and fixtures or equipment, the commission prepares a plan of measures for the plant, which is submitted for approval to the chief engineer. Representatives of enterprises which figured as developers or suppliers as well as of scientific research organizations are engaged to participate in conducting the analysis by decision of the commission.

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